

PB84-166990

EPA's (Environmental Protection Agency's)
Center for Water Quality Modeling

(U.S.) Environmental Research Lab., Athens, GA

1984



U.S. Department of Commerce
National Technical Information Service
NTIS

EPA-600/D-84-056
1984

EPA'S CENTER FOR WATER QUALITY MODELING

by

Thomas O. Barnwell, Jr.
Environmental Research Laboratory
U.S. Environmental Protection Agency
Athens, GA 30613

ENVIRONMENTAL RESEARCH LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
ATHENS, GA 30613

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SPRINGFIELD, VA. 22161

TECHNICAL REPORT DATA		
(Please read instructions on the reverse before completing)		
1. REPORT NO. EPA-600/D-84-056	2.	3. RECIPIENT'S ACCESSION NO. PB84-166990
4. TITLE AND SUBTITLE EPA's Center for Water Quality Modeling	5. REPORT DATE 1984	
	6. PERFORMING ORGANIZATION CODE	
7. AUTHOR(S) Thomas O. Barnwell, Jr.	8. PERFORMING ORGANIZATION REPORT NO.	
9. PERFORMING ORGANIZATION NAME AND ADDRESS Environmental Research Laboratory U.S. Environmental Protection Agency College Station Road Athens GA 30613	10. PROGRAM ELEMENT NO. AARB1A	
	11. CONTRACT/GRANT NO.	
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency--Athens GA Office of Research and Development Environmental Research Laboratory Athens GA 30613	13. TYPE OF REPORT AND PERIOD COVERED Published paper	
	14. SPONSORING AGENCY CODE EPA/600/01	
15. SUPPLEMENTARY NOTES		
16. ABSTRACT The U.S. Environmental Protection Agency (EPA) established the Center for Water Quality Modeling to provide a focal point for water quality modeling activities. The Center supports a range of techniques and computer programs for water quality analysis ranging from simple desk-top techniques appropriate for preliminary analysis to sophisticated continuous simulation models for detailed planning. This paper describes the models supported by the Center and gives an overview of the Center's activities, which include distribution and maintenance of computer programs, training, and sponsorship of a users group.		
17. KEY WORDS AND DOCUMENT ANALYSIS		
a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
18. DISTRIBUTION STATEMENT RELEASE TO PUBLIC	19. SECURITY CLASS (This Report) UNCLASSIFIED	21. NO. OF PAGES 7
	20. SECURITY CLASS (This page) UNCLASSIFIED	22. PRICE

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Thomas O. Barnwell, Jr.
Environmental Research Laboratory
U S EPA, Athens, Ga 30613 USA

ABSTRACT

The U S Environmental Protection Agency (EPA) established the Center for Water Quality Modeling to provide a focal point for water quality modeling activities. The Center supports a range of techniques and computer programs for water quality analysis ranging from simple desk-top techniques appropriate for preliminary analysis to sophisticated continuous simulation models for detailed planning. This paper describes the models supported by the Center and gives an overview of the Center's activities, which include distribution and maintenance of computer programs, training, and sponsorship of a users group.

Keywords: water quality models, stormwater models, technology transfer

As part of the national effort to implement the Clean Water Act, water quality planners and managers in the United States have increasingly used mathematical models to analyze water quality problems. These models are used in conducting evaluations of waste loads from point and nonpoint sources and in pollutant exposure assessments. To encourage the wider application of these effective techniques, EPA's Office of Research and Development established the Center for Water Quality Modeling as a central service activity where users can obtain models and assistance in their use.

The Center for Water Quality Modeling is located at EPA's Environmental Research Laboratory in Athens, GA, which has long been involved in the development and application of mathematical models that predict the transport and fate of water pollutants. For selected water quality and pollutant loading models, the Center provides a central file and distribution point for computer programs and documentation. In addition, the Center sponsors workshops and seminars that provide both generalized training in the use of models and specific instruction in the application of individual simulation techniques.

The modeling packages currently available through the Center were selected from many candidate models by experienced users in EPA regulatory and regional offices and by the Center staff. Selection criteria included model utility and effectiveness, availability of adequate documentation, degree of acceptance and application by users, and the Center staff's experience with the software. A wide range of analysis techniques is provided, ranging from simple desk-top techniques suitable for screening analysis through computerized steady-state models to sophisticated, state-of-the-art continuous simulation models. Modeling packages currently supported by the Center are:

Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants (Mills et al., 1982) -- simplified desk-top procedures for pollutant screening and waste load assessment appropriate for hand calculators. It includes a discussion of the environmental chemistry of synthetic organic chemicals and metals; a chapter on waste source estimation techniques; and simple methods for assessment of pollutant fate and transport in rivers, lakes and estuaries.

Exposure Analysis Modeling System (EXAMS) (Burns, Cline and Lassiter, 1982) -- a steady-state screening model for the aquatic fate of synthetic organic chemicals. It includes sophisticated descriptions of chemical fate processes in the environment.

Stream Water Quality Model QUAL-II (Roesner, Gigure and Evenson, 1981) -- a steady-state model for conventional pollutants in streams and well-mixed lakes. QUAL-II is widely used for waste load allocation and permitting in the U S and other countries. It has a 15 year history of application and is a proven, effective analysis tool.

Storm Water Management Model (SWMM) (Huber et al., 1981) -- an urban drainage quantity/ quality model. SWMM also has a long history of use in the U S and Canada for urban drainage assessment and design.

Agricultural Runoff Management (ARM) (Donigian et al., 1977) and **Non Point Source (NPS)** (Donigian and Crawford, 1976) -- techniques for assessing agricultural and urban nonpoint source pollutant loadings. The models use the Stanford Watershed Model for the water balance and extend this model to the assessment of nonpoint source pollution from agricultural and urban areas.

Hydrologic Simulation Program - FORTRAN (HSPF) (Johanson et al., 1984) -- a comprehensive package for simulation of watershed hydrology and water quality for both conventional and toxic organic pollutants. HSPF incorporates the watershed-scale ARM and NPS models into a basin-scale analysis framework that includes fate and transport in stream channels.

Water Analysis Simulation Program (WASP) (Di Toro, Fitzpatrick and Thomann, 1983) and its extension to toxic contaminants, **TOXIWASP** (Ambrose, Hill and Mulkey, 1983) -- a generalized modeling framework for contaminant fate and transport in surface waters. WASP has been used in the North American Great Lakes to assess eutrophication problems. TOXIWASP has been applied in Mississippi and in the Delaware estuaries to examine fate and transport of toxic contaminants.

In responding to requests for software, the Center provides a copy of the model documentation and a magnetic tape of the computer code, which is to be copied by the user and returned to the Center. The Center also functions as a clearing house for correcting coding errors or other problems that are discovered as the techniques are applied. This vital information exchange function also helps users obtain correct computations when applying a model developed for one purpose to a new and different problem. New software releases periodically document code updates and corrections to known problems. Model maintenance activities focus on overcoming problems in the use of models; further development, refining, and extensions of these models is a separate research and development activity.

Instruction in the use of supported models is provided through workshops and technical seminars sponsored by the Center in cooperation with EPA's Center for Environmental Research Information (CERI). Instructors for these training activities are experts from the Athens and other ORD laboratories and from organizations that developed the models under EPA auspices. Workshops are open to all model users on a space-available basis.

The Center also sponsors the Storm Water and Water Quality Model Users Group (formerly SWMM Users Group). The Users Group meets semi-annually to exchange information on applications and results of model use. This forum enables the timely exchange of information on model refinements, code changes, and model adaptations as well as identification of problem areas and model use limitations. The meetings alternate between the United States and Canada and proceedings of the U S meetings are published by the Center. Users Group members receive copies of these proceedings free of charge. Proceedings of the Canadian meetings are published on an ad hoc basis by the meeting host and there is usually a nominal charge for these proceedings.

The Center periodically distributes, free of charge, a newsletter to Users Group members. The Users Group consists of a large number of model users and developers in international, federal, regional and state environmental management agencies and their consultants, and in private industry and academia. The newsletter provides helpful hints to model users and communicates information on scheduled workshops, model improvements and developments, the availability of technical documents, and planned meetings and conferences. More information about the Center and its supported models is available from:

Thomas O. Barnwell, Jr.
Center for Water Quality Modeling
U S EPA
Athens, Ga 30613
USA
404/546-3175 or FTS/250-3175

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